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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/594,017

06/22/2007

John Moyes

INTLTD.75355

6086

27629 7590 04/18/2012  
FULWIDER PATTON LLP  
6060 CENTER DRIVE  
10TH FLOOR  
LOS ANGELES, CA 90045

EXAMINER

WOOD, JARED M

ART UNIT

PAPER NUMBER

1731

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04/18/2012

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/594,017	MOYES ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	JARED WOOD	1731	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2012.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 5) ☒ Claim(s) 1,2,5-32 and 34-38 is/are pending in the application.
- 5a) Of the above claim(s) 34 and 35 is/are withdrawn from consideration.
- 6) ☒ Claim(s) 28,29,37 and 38 is/are allowed.
- 7) ☒ Claim(s) 1,2,5-9,11-14,16-32 and 36 is/are rejected.
- 8) ☒ Claim(s) 10 and 15 is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                        |                                                                   |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/06/2011</u> .                                              | 6) <input type="checkbox"/> Other: ____.                          |

### **DETAILED ACTION**

The examiner acknowledges receipt of the response filed 02/22/2012. Claims 3, 4, and 33 are cancelled. Claims 34 and 35 are currently withdrawn from consideration. Claims 1, 2, 5-32 and 36-38 are currently pending for examination.

#### ***Claim Rejections - 35 USC § 112***

In view of the amendment to claim 19 filed 02/22/2012, the previously issued rejection under 35 U.S.C. 112 has been withdrawn.

#### ***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

**Claims 1, 2, 5-9, 11-14, 16, 20, 22-27, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2004/0228783 (Harris et al.) in view of US 5,232,490 (Bender et al.).**

As to claims 1, 13, and 14, Harris discloses a process for leaching a target metal from an ore, particularly nickel/cobalt from lateritic ores (§ 0088), comprising producing HCl in a pyrohydrolysis stage from a metal chloride solution (§ 0123-0124) wherein the cation may be calcium (§ 0021-0023), passing the generated acid solution, which further comprises an amount of the metal (calcium) chloride, to an atmospheric leach stage (§ 0123) where an ore such as laterite (oxidized metalliferous material) is contacted with the HCl/metal chloride solution to leach a target metal (§ 0092, 0099), specifically nickel/cobalt, into the solution, passing the

Art Unit: 1731

pregnant solution to at least one precipitation stage to recover the nickel/cobalt from the solution wherein the metal chloride in the solution is maintained and further generated (§ 0121-0122) by the addition of a pH adjusting agent which may be lime (CaO) (§ 0117, 0120), and passing the target metal depleted metal chloride solution to the pyrohydrolysis stage to regenerate the HCl (§ 0123-0124). Harris discloses that his leach solution should have a total chloride concentration of 200-500 g/L (§ 0102) which corresponds to 5.64-14.10 M. In the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990), see MPEP 2144.05. Harris discloses that his leach solution has a preferred Mg/HCl ratio 0.4-1.0 (§ 0102) based on the use of MgO as the pH adjusting agent. This ratio can be used to determine how much of the total chloride concentration of the solution would be  $MgCl_2$  which could then be used to find the minimum concentration of  $CaCl_2$  at the minimum preferred converted Mg/HCl ratio in the solution if CaO were used as the pH adjusting agent instead of MgO according to the following calculations:

Art Unit: 1731

$$MgCl_2 = 95.21 \text{ g/mol}$$

$$CaCl_2 = 110.98 \text{ g/mol}$$

$$HCl = 36.46 \text{ g/mol}$$

$$Cl = 35.45 \text{ g/mol}$$

Q102 of Annex provides  
for:

total Cl content of  
200 - 500 g/L

$Mg/HCl$  ratio (mass/mass)  
0.4 - 1.0

Conversion of  $Mg/HCl$  to grams of Cl from  $MgCl_2$   
grams of Cl from HCl

$$\frac{1 \text{ g } Mg}{1} \cdot \frac{95.21 \text{ g } MgCl_2}{24.305 \text{ g } Mg} \cdot \frac{2 \cdot 35.45 \text{ g } Cl}{95.21 \text{ g } MgCl_2} = 2.92 \text{ g } Cl \text{ from } MgCl_2$$

$$\frac{1 \text{ g } HCl}{1} \cdot \frac{35.45 \text{ g } Cl}{36.46 \text{ g } HCl} = 0.97 \text{ g } Cl \text{ from } HCl$$

$$\therefore \frac{Mg}{HCl} = \frac{2.92 \text{ g } Cl \text{ from } MgCl_2}{0.97 \text{ g } Cl \text{ from } HCl} = \frac{3 \text{ g } Cl \text{ from } MgCl_2}{1 \text{ g } Cl \text{ from } HCl}$$

Calculation of minimum Cl content of livestock from  $MgCl_2$  @ preferred  $Mg/HCl$

$$\begin{aligned} \text{Let } x &= \text{g } Cl \text{ from } MgCl_2 \\ y &= \text{g } Cl \text{ from } HCl \\ \text{total Cl} &\rightarrow x + y = 200 \text{ g/L} \end{aligned}$$

$$\frac{Mg}{HCl} \text{ ratio} \rightarrow \frac{3x}{1y} = 0.4$$

Solve for x:

$$x + y = 200$$

$$x = 200 - y$$

Substitute into  $\frac{Cl}{HCl}$ :

$$\frac{3(200 - y)}{y} = 0.4$$

$$600 - 3y = 0.4y$$

$$3.4y = 600$$

$$y = 176.47 \text{ g } Cl \text{ from } HCl$$

$$\therefore x = 23.53 \text{ g } Cl \text{ from } MgCl_2$$

If  $CaCl_2$  is used rather than  $MgCl_2$  (i.e.  $Ca$  used instead of  $Mg$  as precipitating agent), then g of Cl from  $CaCl_2$  would be identical to that of  $MgCl_2$  since same mole ratio.

$$\therefore \text{g } Cl \text{ from } CaCl_2 = 23.53 \text{ g}$$

$$\frac{23.53 \text{ g } Cl}{1 \text{ L}} \cdot \frac{110.98 \text{ g/mol } CaCl_2}{2 \cdot 35.45 \text{ g/mol } Cl} = 36.83 \text{ g/L } CaCl_2$$

Harris does not disclose the addition of sulfuric acid to the metal chloride solution to regenerate the HCl.

Bender discloses a leaching process where sulfuric acid may be used to generate HCl in a metal chloride solution comprising  $\text{CaCl}_2$  wherein such addition also produces a calcium sulfate precipitate (col. 9, ln. 10-32).

It would have been obvious to one of ordinary skill in the art at the time of invention to use sulfuric acid addition of Bender in place of Harris's pyrohydrolysis stage in order to prevent calcium build-up in the system when lime or another calcium containing pH adjusting agent is used in the process of Harris (Bender, col. 9, ln. 15-18).

**As to claim 2**, Bender discloses that when sulfuric acid is added to the  $\text{CaCl}_2$  containing solution, HCl and a calcium sulfate precipitate are formed (col. 9, ln. 10-32).

**As to claims 5, 20, 22, and 23**, since the combined process of Harris and Bender seeks to recover nickel/cobalt, as opposed to precious metals or magnesium, the limitations of these claims are not relevant and are therefore rejected concurrently with the claims upon which they depend.

**As to claims 6-9**, Harris discloses that his leaching stage may comprise a first and second leaching step where, as shown in figure 2, the leaching is carried out counter-currently (solids from first step are passed to second step and liquids from second step are passed to first step) (§ 0127). Bender discloses that his regeneration may be done ex situ or in situ with the leaching (i.e., second leach step) (col. 9, ln. 12-14).

Art Unit: 1731

**As to claims 11 and 12,** Bender discloses that when sulfuric acid is added to the  $\text{CaCl}_2$  containing solution, HCl and a calcium sulfate precipitate are formed (col. 9, ln. 10-32). Harris's solid fraction is separated (including precipitates) from the pregnant leach solution and disposed of (§ 0116).

**As to claims 16, 24, and 25,** Harris discloses that other value metals such as Cu, Mn, Al, and/or Cr may be present in the leach solution and may be recovered via ion exchange, solvent extraction, electrowinning, or precipitation. If more than one of the value metals may be recovered via electrowinning, it would have been obvious to one of ordinary skill in the art at the time of invention to recover each of the value metals in an electrowinning process which is particular to each metal to provide for the most complete and pure recovery.

**As to claim 26,** Harris discloses that his leach solution should have an initial pH of less than 0.5 (§ 0109). Since the leach solution of the combined disclosures has substantially the same composition, especially chloride and HCl (see treatment of claims 28 and 29 below), and pH as applicant's claimed leach solution, it would be expected that the leach solution would likewise have an Eh of ~600mv.

**As to claim 27,** Harris discloses carrying out leaching at a temperature of 75 °C to the boiling point of the leach solution (§ 0110). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990), see MPEP 2144.05.

**As to claims 30 and 31,** the treatment of claim 1 is likewise applied to claim 30. Harris further discloses that his leaching stage may comprise a first and second leaching step where, as

Art Unit: 1731

shown in figure 2, the leaching is carried out counter-currently (solids from first step are passed to second step and liquids from second step are passed to first step) (§ 0127). Bender discloses that his regeneration may be done ex situ or in situ with the leaching (i.e., second leach step) (col. 9, ln. 12-14). Figure 2 of Harris further shows a recycle of the process liquor from the second leaching stage to the first leaching stage. Harris's solid fraction is separated (including precipitates) from the pregnant leach solution in the second leaching step and disposed of (figure 2; § 0116).

**As to claim 32**, Harris discloses that iron is leached from the laterite and is precipitated as magnetic iron oxide and/or hematite (§ 0109).

**Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2004/0228783 (Harris et al.) in view of US 5,232,490 (Bender et al.) as applied to claim 13 above, and further in view of WO 02/22897 (Cheng).**

**As to claims 17 and 18**, Harris discloses that leaching is conducted first at a low pH and then the pH is subsequently raised to precipitate iron oxide from the leach solution (§ 0109) but fails to expressly disclose the means whereby the pH is to be raised. Harris further discloses that due to the high chloride concentration of his leach solution and the low activity of water iron formation of hematite and magnetic iron oxide during precipitation is favored (§ 0097).

Cheng discloses a nickel laterite ore leaching and nickel recovery process in which limestone (calcium carbonate) is used to precipitate iron from the pregnant leach solution in an initial precipitation step (figures 2 and 3).



It would have been obvious to one of ordinary skill in the art at the time of invention to use substantially any known precipitation agent, such as the limestone suggested by Cheng, in the combined process of Harris and Bender in order to effect Harris's disclosed iron oxide precipitation especially since Cheng discloses limestone addition to a pregnant leach solution from the leaching of nickel laterite ores in an initial iron precipitation step (figures 2 and 3).

**Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 2004/0228783 (Harris et al.) in view of US 5,232,490 (Bender et al.) as applied to claim 13 above, and further in view of WO 03/035916 (Hamalainen).**

Harris discloses that copper, when present in the pregnant leach solution, may be recovered via a precipitation step (§ 0117).

However, Harris fails to disclose the specific means for carrying out such a precipitation.

Hamalainen discloses the precipitation of a copper compound from a copper containing chloride leach solution by addition of limestone (calcium carbonate) (pg. 3, ln. 22-24).

It would have been obvious to one of ordinary skill in the art at the time of invention to use any known precipitation agent to precipitate copper from Harris and Benders chloride leach solution, especially limestone as suggested by Hamalainen because it is a well-known and inexpensive reagent (pg. 3, ln. 22-24).

**Claims 21 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2004/0228783 (Harris et al.) in view of US 5,232,490 (Bender et al.) as applied to claim 13 above, and further in view of US 3,203,786 (Wesolowski et al.)**

Art Unit: 1731

The combined disclosures of Harris and Bender provide of nickel/cobalt precipitation by addition of a pH adjustment agent such as lime, caustic soda, or magnesium oxide (§ 0117 and 0120).

Neither Harris nor Bender expressly provide for using calcium hydroxide (slaked lime) as a precipitation agent, especially in the precipitation of nickel/cobalt.

Wesolowski discloses selective precipitation of nickel and cobalt from an acidic leach solution by pH adjustment using lime milk (calcium hydroxide or slaked lime) (col. 2, ln. 34-41).

It would have been obvious to one of ordinary skill in the art at the time of invention to substitute the lime milk disclosed by Wesolowski in place of the lime, caustic soda, or magnesium oxide of Harris being functional; expedients of one another disclosed to be used for the same purpose by the art.

#### *Allowable Subject Matter*

Claims 28, 29, 37, and 38 are allowed.

Claims 10 and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: No prior art has been found to disclose or reasonably suggest diverting a portion of the solution from the second leaching stage back to the acid generation stage. Further, no prior art has been discovered to disclose or to reasonably suggest maintaining a prescribed amount of the metal of the metal halide in the leach solution by adding a make-up amount of the metal as a compound

Art Unit: 1731

during target metal precipitation rather than by removing an excess amount of the metal by sulfuric acid addition during acid regeneration.

Claims 28 and 29 are dependent upon either of claims 37 and 38 which are allowable and are therefore likewise allowable.

### ***Response to Arguments***

Applicant's arguments filed 02/22/2012 have been fully considered in part persuasive.

On page 10, applicant argues that if Bender's sulfuric acid addition was applied into the process of Harris then undesirable jarosites would form. However, applicant's claim does not require that jarosites are not formed. Further, even if in *arguendo* applicant's claims included such a limitation, it is noted that jarosites would not be formed. The rejection as provided above replaces Harris's disclosed pyrohydrolysis treatment with sulfuric acid addition. Therefore at the time of sulfuric acid addition no iron would be present in the solution and therefore, jarosites, which are iron containing hydroxysulfates, could not be formed. As such, applicant's argument is not persuasive.

On page 10, applicant argues that sulfuric acid addition would conflict with Harris's pyrohydrolysis. However, the rejection as provided above provides for replacement of the pyrohydrolysis with the sulfuric acid addition of Bender. Therefore, applicant's argument is not persuasive.

On page 10, applicant further argues that if the pyrohydrolysis treatment is replaced by sulfuric acid addition, that Harris's MgO precipitation agent would need to be replaced.

Art Unit: 1731

However, this is an integral component of the rejection provided above. As such, applicant's argument is without merit and is not persuasive.

As to applicant's arguments on pages 11 and 12 regarding the substance of previous claims 28 and 29, now included in claims 1 and 30, it is noted that the examiner mistakenly interpreted Harris's disclosed Mg/HCl ration from ¶ 0102 as being a mole ratio rather than a mass ratio. As such, the examiner's rejection of claim 29 was in error. Therefore, the examiner has made this action non-final with a more correct and explained treatment of the subject matter of previous claim 29 now incorporated into claims 1 and 30. As previously stated, in the rejection above, Harris's MgO which is preferred in conjunction with the disclosed pyrohydrolysis treatment has been replaced by Harris's also disclosed lime (CaO) which would result in a CaCl<sub>2</sub> containing solution. In the rejection above the examiner has provided for a minimum preferred CaCl<sub>2</sub> concentration of the solution based upon Harris's disclosed total chloride concentration in the solution and Harris's disclosed preferred Mg/HCl ratio.

As to the disclosure of Harris ¶ 0051, the examiner has not relied upon this portion of Harris's disclosure for the determination of the CaCl<sub>2</sub> of the solution. It is further noted that this paragraph provides for an optional *additional* component added in an amount relative to the preferred MgCl<sub>2</sub> content of the solution. This additional component is in addition to the necessary chloride content not a substitution of any part of the chloride content of the solution as characterized by applicant on page 12.

On page 12, applicant further argues that at 500 g/L total chloride concentration, the preferred maximum disclosed by Harris, there would be too much HCl present in the solution to prevent jarosite formation. It is once again noted that applicant's claims do not require that

Art Unit: 1731

jarosites are not formed. Further, the range disclosed by Harris overlaps applicant's claimed range and a prima facie case of obviousness therefore exists. To establish non-obviousness applicant must either establish that the rejection as presented by the examiner is in error or provide for secondary considerations with the necessary evidence and declarations to establish non-obviousness.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JARED WOOD whose telephone number is (571)270-5911. The examiner can normally be reached on Monday - Friday, 7:30 am - 5:00 pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571)272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 10/594,017

Page 13

Art Unit: 1731

/JARED WOOD/

Examiner, Art Unit 1731

/ Roy King/

Supervisory Patent Examiner, Art Unit 1733